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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/580,196

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Volker Gallatz

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ROYLANCE, ABRAMS, BERDO & GOODMAN, L.L.P.

1300 19TH STREET, N.W.

SUITE 600

WASHINGTON,, DC 20036

EXAMINER

COLEMAN, KEITH A

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/580,196	Applicant(s) GALLATZ ET AL.	
	Examiner KEITH COLEMAN	Art Unit 3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 7-10 is/are rejected.
- 7) ☒ Claim(s) 5,6 and 11-14 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>9/5/2007;5/23/2006</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Objections

Claims 5, 6, and 11-14 objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claims 5, 6, and 11-14. See MPEP § 608.01(n). Accordingly, the claims have not been further treated on the merits.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ward (US Patent No. 4,138,980).

With regards to claim 1, the patent to Ward discloses a process for ignition of combustion of fuel in the combustion space (i.e. interior of chamber 22, See Figure 1) of an engine (Col. 1, Line 17) by injecting into the combustion space (i.e. interior of chamber 22, See Figure 1) microwave radiation produced in a microwave source (10, Col. 4, Line 52, Figure 1) outside of the combustion space (i.e. interior of chamber 22, Figure 1), the injected microwave radiation being absorbed by the fuel distributed in the combustion space (i.e. interior of chamber 22, Col. 5, Lines 30-40 and Lines 50-60), and due to the energy delivery into the fuel which occurs due to absorption the combustion being ignited essentially at the same time (Col. 5, Lines 50-60), distributed over a large volume in the combustion space (i.e. the entire volume of the interior of chamber 22, Col. 5, Lines 30-40 and Lines 50-60), except positively disclosing preferably uniformly distributed in the entire combustion space. Since Ward explicitly states on Col. 3, Lines 37-45 that "For combustion chambers of arbitrary shape or changing shape, one can **optimize coupling of the microwave energy** by operating at frequencies with corresponding wavelengths smaller than the chamber dimensions. In this way microwave energy can be radiated out to the flame, and also one or more standing

waves, or cavity modes, can be set up which permits the maintenance of **continuous high electric fields**.”, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the engine of Ward with wherein the microwaves are uniformly distributed in the entire combustion space in order to maintain an equilibrium (Col. 3, Line 46 from Ward)

With regards to claim 2, the patent to Ward discloses wherein the microwave radiation is injected in the form of one or more microwave pulses of short time duration and high energy (See Col. 3, Lines 37-45 and rejection in claim 1).

With regards to claim 3, the patent to Ward discloses wherein the number of microwave pulses and/or their power and/or their pulse duration and/or their instant is controlled depending on the operating state of the engine (i.e. electromagnetic wave frequencies, Col. 3, Lines 1-5, dependent on speed of combustion reactions, Col. 2, Lines 60-65, lean combustion, Col. 1, Lines 40-45) and the power demand on the engine (i.e. watts needed to combust fuel, See Col. 5, Lines 33-36).

With regards to claim 4, the patent to Ward discloses wherein preferably 1 to 10 microwave pulses, especially 1 to 5 microwave pulses, are used (i.e. a wave, See Col. 3, Line 42), preferably with a power between 1 kW and 70 kW (i.e. 1KW, See Col. 5, Line 35), a pulse duration (i.e. one cycle) between 1 ns and 2 ms (i.e. 3×10^8 Hz [cycles per second] is inherently 3.3×10^{-9} seconds per cycle or 3.3 nanoseconds per

cycle), except positively disclosing a pulse spacing between 100 ns and 2 ms (i.e. 3×10^{10} Hz is inherently 333.33×10^{-9} or 333 nanoseconds). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the engine of Ward (US Patent No. 4,138,980) with a pulse spacing between 100 ns and 2 ms (i.e. 3×10^{10} Hz is inherently 333.33×10^{-9} or 333 nanoseconds) because the modification is invariably a change in optimized range. See MPEP 2144.04. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C and 80°C and an acid concentration between 25% and 70% was held to be *prima facie* obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%.); see also *Peterson*, 315 F.3d at 1330, 65 USPQ2d at 1382 (“The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.”)

With regards to claims 5 and 6, see claim objection above.

With regards to claim 7, the patent to Ward discloses a microwave source (10) located outside of the combustion space (i.e. interior of chamber 22) and a microwave window (i.e. spark plug 20, See Claim 10) connected to the microwave source (10), and the microwave radiation can be injected into the combustion space (i.e. interior of chamber 22) by way of the microwave window (i.e. spark plug 20, See Claim 10) so that

the injected microwave radiation can be absorbed by the fuel distributed in the combustion space (i.e. interior of chamber 22), and due to the energy delivery into the fuel which occurs due to absorption combustion can be ignited essentially simultaneously (Abstract), distributed over a large volume in the combustion space (i.e. interior of chamber 22), except positively disclosing preferably uniformly distributed in the entire combustion space. Since Ward explicitly states on Col. 3, Lines 37-45 that “For combustion chambers of arbitrary shape or changing shape, one can **optimize coupling of the microwave energy** by operating at frequencies with corresponding wavelengths smaller than the chamber dimensions. In this way microwave energy can be radiated out to the flame, and also one or more standing waves, or cavity modes, can be set up which permits the maintenance of **continuous high electric fields.**”, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the engine of Ward with wherein the microwaves are uniformly distributed in the entire combustion space in order to maintain an equilibrium (Col. 3, Line 46 from Ward)

With regards to claim 8, the patent to Ward discloses wherein the microwave source (10) is supplied by an electric power supply source (See Figure 1) which delivers electrical pulses which can be converted into microwave pulses by the microwave source (10).

With regards to claim 9, the patent to Ward discloses wherein between the microwave source (10) and the microwave window (i.e. spark plug 20, See Claim 10), preferably over the course of the microwave line (18), there is a coupling means (24) which transmits the microwaves sent from the microwave source (10) to the microwave window (i.e. spark plug 20, See Claim 10), but which does not transmit the microwaves reflected by the combustion space (i.e. interior of chamber 22) back into the microwave source (10, See Col. 4, Lines 65-68).

With regards to claim 10, the patent to Ward discloses wherein the coupling means (24a) has a triple port, especially a circulator (i.e. distributor 12) with a microwave source (10) connected to its first port (24a), a microwave window (i.e. spark plug 20 connected 18a) connected to its second port, and a preferably passive microwave consumer (16, 24a to 28a) connected to its third port.

With regards to claims 11-14, see claim objection above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Cesa (US Patent No. 7,201,882) shows the current state of the art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH COLEMAN whose telephone number is (571)270-3516. The examiner can normally be reached on 5:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Cronin can be reached on (571)272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KAC
/K. C./
Examiner, Art Unit 3747

/Stephen K. Cronin/
Supervisory Patent Examiner, Art Unit 3747